of radiation to the tumor periphery? What is the ideal number of catheters to produce a homogeneous distribution of radiation? Is the frequency of symptomatic radionecrosis less with a particular technique of radiodosimetry? Are there anatomic sites of tumor or tumor geometries that are ideal for or that contraindicate brachytherapy?

The technology and equipment required to do brachytherapy are now commonplace. Until these questions are answered in authoritative studies, however, brachytherapy remains a therapy under review.

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Intrauterine Surgical Procedures and the Management of Hydrocephalic Fetuses

BEFORE THE EARLY 1960s, experience with human fetal operations was nonexistent. Ten years later, refinements were being made with ultrasonography that led to unprecedented images of the fetal anatomy. With current technical advances, high-resolution, real-time ultrasonography can portray excellent detail of the entire fetus and, in particular, the developing nervous system. At 9 and 12 weeks of gestational age, the fetal skull and lateral ventricles, respectively, can be recognized. Although fetal hydrocephalus has become easy to identify during the third trimester, earlier detection of ventricular enlargement—that is, during the second trimester—continues to pose a difficult management problem.

Experience with animal models of fetal hydrocephalus seemed to indicate that in utero diversion of cerebrospinal fluid to the amniotic cavity was beneficial in reducing the adverse effects of hydrocephalus, such as ependymal destruction, periventricular gliosis and loss of the cortical mantle. Several reports have now been published describing the placement of ventriculoamniotic shunts into hydrocephalic human fetuses. Although ventricular decompression was achieved in most of the reported cases, technical problems such as shunt migration and malfunction were not insignificant. Perhaps the most important observation in this group was the associated anatomic defects involving the central nervous system (CNS). Highly skilled ultrasonographers using the most advanced equipment may fail to recognize these associated defects. Thus, false expectations regarding survival and future outlook based on sonographic data may lead to inappropriate in utero intervention.

Tantamount to the recognition of these associated anomalies is understanding the natural history of fetal hydrocephalus. In a retrospective analysis of 24 cases with fetal ventriculomegaly followed to term, Glick and colleagues identified 11 fetuses that had isolated ventricular enlargement without associated life-threatening anomalies. Of the 11 fetuses, 10 showed stable ventricular size throughout gestation; only one fetus showed a progressive increase in the size of the ventricles. Three newborns required a shunt due to increased intracranial pressure. Additional CNS malformations were recognized in three cases soon after birth, however, which again points out the limitations of fetal ultrasonography. In addition, 80% of those infants requiring ventricular shunt procedures developed normally, emphasizing the unlikeliness of improving outcome with an intrauterine ventriculoamniotic shunt.

Most neurosurgeons have now placed a moratorium on the in utero treatment of fetal hydrocephalus. The high incidence of concomitant congenital anomalies associated with fetal ventriculomegaly, a better understanding of the natural history of this entity and a lack of adequate time for follow-up on those infants who undergo intrauterine shunt insertion justifies this prenatal policy of nonintervention. A fetus in the midtrimester that is normal by routine screening methods but showing progressive ventricular enlargement and no other recognizable defects represents a challenging therapeutic dilemma. If pulmonary maturity can be verified or induced with steroids, delivery should be carried out and a shunt placed. If the viability of the fetus is questionable, however, a conservative approach seems indicated until maturity develops and warrants preterm delivery.

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AIDS and the Nervous System

EPIDEMIOLOGIC STUDIES have shown that fully 39% of patients with the acquired immunodeficiency syndrome (AIDS) have significant neurologic complaints, and neurologic symptoms led to the initial diagnosis in 10% of all patients with AIDS. These patients most frequently present with progressive dementia, although seizures and focal neurologic deficits are common. Computed tomographic (CT) brain scans are normal in 41% of these patients and show diffuse cerebral atrophy in 38% and space-occupying lesions in 22%. Those patients with atrophy on CT scans appear to be at a higher risk of neurologic progression than those with normal CT scans. Recent studies indicate that magnetic resonance (MR) imaging is much more sensitive than CT for showing intracranial pathology in a patient with neurological symptoms, and thus MR imaging is now the neuroimaging procedure of choice in the screening of these patients.

The most common neurologic syndrome in a patient with AIDS is subacute encephalitis; this progressive, invariably fatal, dementing illness probably results from primary infection of the brain with human T-cell lymphotropic virus type III, the virus presumed to cause AIDS. The other most frequent neuropathologic processes included cryptococcal meningitis, *Toxoplasma gondii* encephalitis or abscess or both and primary central nervous system (CNS) lymphoma. There have been several reports of multiple coexisting intracranial pathologic conditions developing in AIDS patients.

Current recommendations for the evaluation of a patient with AIDS who has CNS symptoms include initial screening with MR imaging. If a space-occupying lesion is identified

and the patient is neurologically stable, an empiric trial of antitoxoplasma therapy is instituted. If the patient is neurologically unstable, harboring a large mass lesion with risk of herniation or fails to respond to a three-week trial for presumed toxoplasmosis, biopsy is indicated. As several intracranial pathologic conditions may exist, repeat biopsy of lesions that progress despite specific therapy may be indicated to identify other treatable processes. In those patients without lesions on MR imaging, lumbar puncture should be done and treatment initiated on the basis of the cerebrospinal fluid findings. Those patients with normal neuroradiologic and cerebrospinal fluid findings warrant close clinical follow-up and repeat studies at regular intervals or at the time of neurologic progression.

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Ultrasonographic Evaluation of Carotid Artery Disease

NONINVASIVE SCREENING TESTS of the carotid bifurcation, which aid in selecting patients for carotid arteriography, help avoid the morbidity and cost of that procedure and provide for safe serial examination of carotid disease. The two most widely accepted, increasingly available and reasonably accurate tests are duplex ultrasonography or scanning and digital intravenous angiography. Duplex scanning combines a B-mode, range-gated, short pulse ultrasound beam producing a high-resolution, real-time image of the vessel with a spectrum analysis display of the blood flow frequencies and amplitudes at that locus.

Both digital intravenous angiography and duplex scanning are highly sensitive for detecting stenotic lesions of 50% or more, with neither test being clearly superior. Digital subtraction angiography tends to underestimate disease severity in 72% of cases, whereas duplex scanning tends to overestimate 64% of the time. Duplex scanning is excellent for visualizing the "soft plaque," but its specificity for ruling out any degree of disease is only 20%. Spectral analysis improves considerably the accuracy of the B-mode image by detecting minimal and calcium-covered lesions usually overlooked by the latter. In several studies of stenosis alone, duplex scan sensitivity ranged from 90% to 95%, specificity 87% to 96% and accuracy 86% to 95%. Results of ultrasound studies agreed with those of a conventional angiogram absolutely in 71%, well in 20% and poorly in 9%.

Besides requiring a skilled technician, duplex scanning presents other disadvantages such as difficulty in differentiating a tight stenosis from a total occlusion and in identifying ulcerations.

Indications for duplex ultrasonography include an asymptomatic bruit, syncopal episodes, vague neurologic symptoms that might represent stroke, serial assessment of carotid lesions, detecting recurrent stenosis in patients following carotid endarterectomy and screening of patients scheduled for hypotensive anesthesia. It has recently been used intraoperatively to detect flaws in carotid reconstruction. Patients with typical carotid disease symptoms of amaurosis fugax, hemispheric stroke or transient attacks are better studied by conventional biplane arteriography because the likelihood of surgical or aggressive medical treatment is high. Ultrasonography does not delineate the aortic arch vessels, the cervical carotids cephalad to the mandible or the intracranial vessels.

The use of noninvasive testing such as duplex scanning results in a higher yield at cerebral angiography in patients with severe carotid occlusive disease. Nevertheless, the conventional biplane arteriogram at present is still the gold standard for analyzing carotid artery disease, and the final decision to proceed with it must still be based on clinical judgment.

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Cranial Neuropathies

MICROVASCULAR IMPINGEMENT on certain cranial nerves as they traverse the subarachnoid space of the posterior cranial fossa appears to be related (perhaps even causally) to the development of specific sensorimotor syndromes. Cross-compression of these neural structures may produce a focus of hyperexcitability that is manifest in a clinical syndrome relevant to the area mediated by the particular cranial nerve. In the case of the fifth or trigeminal nerve, the syndrome produced is trigeminal neuralgia. In this disorder, patients typically experience unilateral, lancinating, electric shock-like facial pain. If the seventh (facial) nerve is involved, unilateral, paroxysmal facial twitching, which often begins in the region of the orbicularis oculi, termed hemifacial spasm, is the result. Vascular distortion of the glossopharyngeal (ninth) and vagus (tenth) nerves can lead to glossopharyngeal neuralgia. In this syndrome, pain occurs in the pharyngeal region that resembles that of trigeminal neuralgia in its temporal pattern and lancinating quality. Other syndromes purported to result from microvascular compression of the acoustic (eighth) or the spinal accessory (eleventh) nerves have been described but have not yet been as widely accepted.

Although most cases of trigeminal neuralgia respond, at least initially, to carbamazepine therapy, hemifacial spasm and glossopharyngeal neuralgia respond poorly to this and other medical therapy. If the diagnosis can be made and the particular syndrome is refractory to medical management, these patients are candidates for microsurgical decompression of the involved cranial nerve. This is done under general anesthesia via a posterior fossa craniectomy. The cranial nerve is visualized with the aid of an operating microscope, the offending vessel is carefully moved from its point of contact with the nerve and a small piece of teflon felt is interposed between vessel and nerve.

Success with this surgical approach depends on the partic-